Name of the author of the target article: Michelle Ann Kline

PLAY TO LEARN. TEACH BY PLAY.

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Abstract

The synthesis of Kline is notable, but ignores the inseparable role of play in the evolution of learning and teaching in both humans and other animals. Play is distinguished and advantaged by its positive feedback reinforcement through pleasure. Play, especially between adults and infants, is probably the platform from which human learning and teaching evolved.

Main Text

Play is older than culture, for culture, however inadequately defined, always presupposes human society, and animals have not waited for man to teach them their playing.

from *Homo ludens* (Huizinga 1949)

Kline provides a notable synthesis valuable for designing future research on learning and teaching both cross culturally and across species. Kline ties teaching and learning to the cognitive, social and cultural evolution of humans. Although Kline claims to have incorporated "all known teaching mechanisms in humans and other animals into a cohesive theoretical framework" the role of social play is virtually ignored.

Play only seemingly serves no function and has no apparent, immediate benefits, but the incredible phylogenetic depth of play strongly suggests that play is a functional and adaptive behavior (Burghardt 2005). It is well appreciated that play facilitates learning in humans and it is thought that learning is a key explanation and function of play across the animal kingdom (Pellis & Pellis 2009; Pellegrini 2011).

Many lines of evidence point to social play as a prime building block for the evolution of both learning and teaching. Play, in human and non-human infants, provides opportunities for the acquisition of relevant stimuli, for the diffusion of social and environmental knowledge and for the development of fundamental cognitive and communicative capacities (Power 2000). Play reduces spatial separation between individuals (*Macaca tonkeana*, Palagi et al. 2014) and increases cooperation and empathic proclivity (*Pan paniscus*, Demuru & Palagi 2012; *Theropithecus gelada*, Palagi et al. 2009). Play renders individuals more competent in the emotional domain (Pellis & Pellis 2009) thus creating favorable conditions for learning and teaching (Ciani et al. 2012). In brief, play cannot be separated from learning and is a ready built platform to launch teaching.

What differentiates play from other forms of teaching and learning is the positive reinforcement arising from its pleasurable nature (Lewis & Barton 2006; Rilling et al.

2011). Play between adults and infants, in particular, is a behavioral setting in which a 'teacher' and a 'learner' can be clearly recognized. While benefits always overcome costs for immature learners, the costs for adult teachers are generally high and strongly dependent on the type of play and on the social environment. In order for teaching to evolve there should also be some benefits for the teacher. For example, teachers may be related to their pupils, or pupils may be future allies or mates (Mancini & Palagi 2009). In species characterized by a complex sociality, such as human and non-human primates, play between adult and immature subjects can be an important bridge to broaden and strengthen social networks of the adults (Palagi et al. 2004; 2006).

Social play is a multifaceted behavior with various typologies (Palagi 2014; Palagi & Cordoni 2012; Cordoni & Palagi 2011), which come in succession in early stages of life and then integrate one another. Information gathered and lessons learned by playing can be recruited and later remanaged to cope with many other aspects of life. Long-standing data show that the longer the period of development and learning, the more pervasive the social play (Fagen 1993).

Play between mother and offspring is probably both ontogenetically and phylogenetically the first means of teaching and learning. In primates, the role of mothers in the playful exchanges with the newborns is fundamental. For example, in the very first months of life great ape mothers are responsible for initiating and ending play sessions with offspring. Later, newborns spontaneously become more interactive in initiating new playful interactions with their mothers (Hoff et al. 1981; van Lawick-Goodall 1968). Gradually newborns are introduced in the social network of the mother (Berman 1982). During this period the mother actively monitors her infant's play sessions and often modifies their content (Power 2000). The direct, active interventions of the mother

decrease as the infant learns to self-regulate and acquires social and emotional competence (Govindarajulu et al. 1993; Pellis & Pellis 2009). The provision of positive or negative reinforcements by the mother is a form of evaluative feedback (*sensu* Kline) because it leads to the appropriate management of play by infants.

Over time, the infant's sphere of play extends outward to other kin adults and, in tolerant social systems, even to non-kin adults (Ciani et al. 2012). In despotic societies, cultural and social knowledge gained by playing is therefore mainly vertical, limited to close kin while in tolerant societies transmission can also spread horizontally, involving unrelated individuals. Moreover, since unrelated subjects can use different play schemes and modules compared to related subjects, social tolerance enhances the diffusion of behavioral and cultural innovation (Fagen 1993; Huffman et al. 2010). Hence, play is an engine fostering a positive feedback linking tolerance to teaching and learning.

According to Kline, teaching includes specific communicative capacities as behavioral markers or ostensive cues. Similarly play requires intensive, constant exchanges of ostensive signals and can be actively stimulated. Non-human primate research is rich in examples of the capacity of mothers and adults to adapt their communicative schemes to infants. When addressing infants of other females, macaque females (*Macaca mulatta*) use specific vocalizations to communicate their benign intent, a form of metacommunication ("vocal motherese", Whitham et al. 2007). Gorillas (*Gorilla gorilla*) use a higher rate of repetitions and sequences of tactile gestures (Luef & Liebal 2012) when playing with infants. This form of "nonvocal motherese" sustains the development of infant gorillas in the learning process of nonvocal signals and meets the criteria defining direct active teaching (*sensu* Kline).

As Kline notes "the prevalence of teaching in humans and other animals is a contentious issue." However, the existence of play in all human societies and across mammalian species is not. This lends credence to our hypothesis that play may be one of the most basal building blocks from which human learning and teaching evolved.

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